

It's the Performance, Baby!

The Motion Capture Pipeline

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The Motion Capture Process

- Planning
 - Deciding what you want
- Shooting
 - Getting the performances you want
- Processing
 - Making the data faithful to the original performance
- Application
 - Making the CG character move like the original performer



Planning a Mocap Shoot

- Understand your goals – What do I really want?
- What information should I prepare?
 - Shot list
 - Mocap pipeline technical spec
- What arrangements should I make?
 - Talent



Considerations

- Target skeleton/character topology
- Target control structure
- Gross proportional differences
- Target software platform
- Number of characters/performers
- Props



Preparing to Do Mocap

- Shot list – What moves am I going to capture?
- Technical specification – What do I ultimately want to apply the data to?
- Talent arrangements – Who can give me the performance I want?



Preparing the Shot List

- A good shot list is a great cost-saver
- Err on the side of capturing too much
 - Easy to process extra data; harder to go back and shoot more
- Ready stance considerations



The Mocap Tech Spec



Why Pro Talent?



- The “Bob from Accounting” syndrome
 - Comparative costs for talent vs. data capture and processing
- Directing your talent
 - Multiple takes are your friend

Can I Capture My Own?



- Defining your needs
 - Quantity of data
 - Budget
 - Number of CG character targets/performers
 - Realtime vs. Non-realtime
 - Studio environment
- More than just an “animate this character”
- Used to define mocap data pipeline

Use a Mocap Provider?

- What's hard about doing mocap?
 - Difficulty of processing mocap data
 - Difficulty of acquiring "good" data
 - Hardware/maintenance costs
- Getting good marker data is only the beginning!



Other Shoot Considerations

- Props
- Clothing/Costuming



At the Shoot

- Direct the talent
- Remember it's a mocap shoot, not a film shoot
 - Look for motion performance
 - Get props out of the way



Mocap Technology



System Considerations

- Passive vs. Active markers
- Cost
- Data rates
- Transportability
- Configurability
- Durability



Hardware Advances

- Real-Time optical systems
- Linear CCD array-based systems
- Nearly limitless numbers of markers
- Better precision through better calibration



Software Advances

- Automatic marker identification
- Smarter noise filtering/gap filling
- Real-time skeletal solving
- Character mapping tools
- Clip composition tools



Real-Time Capture

- Can provide actor feedback, quick data delivery, and/or live performance broadcast
- Requires assumptions/simplifications
 - Gap filling
 - Noise filtering
 - Processing speed considerations



Non-Realtime Capture

- Fewer restrictions on number of sensors/cameras
- Care less about solving all problems at time of capture
- Can use forward looking data to solve problems
- No actor feedback
- Unusable for live broadcast



Capturing “Good” Data

- Good data now saves much pain later
- Focus on getting the right performance
- Heavy marker redundancy
- System setup and calibration



Mocap Data Processing

- What happens after the shoot?
 - The processing pipeline is still a substantial part of the pipeline
- Why can't I just take my data home?
 - Noise
 - Gaps/missing data
 - Conversion to skeletal data
 - Mapping to target control structure



Data Management

- Why?
 - All the data in the world is useless if I don't know where it is and what it is.
- So I have my 2000 motions. How do I keep track of them?



Shot Tracking

- Relational databases can store info, but not the data itself
- Data usually needs to be stored at various stages
- What info do I need to store in the database?



What to Store



Why is Mocap Unique?

- Mocap is as much about art as it is science
- Not concerned about preserving original data, only original performance
- Essence of a motion is hard to quantify



General Rules of Success

- Solve problems as early as possible
- Capture what you want as closely as possible
- Minimal data alterations
- Reasonable data applications
 - Human mocap will map best onto humanoid characters



The Real World

- We have to animate a broad range of characters with imperfect solutions. How?
- All about deciding what's important
- Imperfect is good enough for most cases



Conceptual Hurdles

- Artistic interpretation shifts more to mocap performer
- Alleviated by providing good motion editing tools to animators
- Almost always need to alter data somewhat



But I NEED to Retarget It!

- Overall scaling to match what's important
- So what's important?
 - Foot plants
 - Hand to object relationships
 - Limb to body relationships
- Depends on the move!



Retargeting Cheats

- Artificial limb length adjustments
- Base pose tweaking
- Marker constraint weighting



Mapping to Control Structures

- “Just animate my character!”
- Character setups are diverse
- Animating character setups requires inverse mapping



Character Setups

- IK-driven limbs
- Various constraints for facing direction, foot orientation, gaze direction, etc.
- Expressions
- Each target package has its own set of character features



Inverse Mapping

- A reverse engineering problem for each target platform
- May avoid inverse mapping by changing what we capture
 - Capture desired end effector locations and limb pointing vectors
- But this makes our motion too character-specific!



It's Working!

- Hardware systems have matured
- Software solutions have incorporated more smarts
- Methods are great when number of source/target skeletons is small compared to number of motions
- Simple retargeting hacks give good results much of the time



Must Go Faster!

- User requirements are becoming more complex
- Hardware and software advances are currently outpaced by user needs and increased use of motion capture in practice


